on the contrary, which rises upwards, and may be driven by winds to and fro, unites with air. I will call the first kind, for distinction sake, *Radiant Heat*." Thus arose the term we still employ. The whole passage reads as if it were written almost at the present day; and the lucid style of the last sentence cannot fail to strike the reader. This is the more remarkable if we contrast it with the current ideas of the time, or even with Scheele's own description of the heat of contact; for a little further on he states, "This heat is a peculiar acid, which has admitted a certain quantity of phlogiston in its mixture."

Soon after this Pictet made his well-known experiments on the reflection of heat. In these he confirms the fact of the reflection and convergence of obscure rays, and discovers that the velocity of radiant heat is beyond the reach of experiment. To him is also due our first knowledge of the apparent reflection of cold, a fact explained some ten years later (1792) by Prevost, according to his famous theory of exchanges.

The experiments on radiation published in England at the close of the last and the early part of the present century, will be familiar to most of our readers. It will be remembered that Sir William Herschel established the refraction of heat, and the difference in the quality of solar and terrestrial heat; that he confirmed Leslie's experiments on the heating power of different parts of the solar spectrum, and first discovered that the maximum heat was beyond the visible red (experiments subsequently verified by Sir H. Englefield); that he also determined the transcalency of various kinds and colours of glass, both to white light and to the light of the spectrum.

Both Rumford's and Leslie's inquiries into the Nature and Propagation of Heat quickly added to this knowledge; to Leslie belonging the capital discovery of the reciprocity of radiation and absorption. The accounts in our modern text-books render a further allusion to these experiments unnecessary.

A quarter of a century now lapsed; the attention of the scientific world being diverted by the electro-chemical discoveries of that period. One of the products of the new activity thus aroused was the discovery of thermo-electricity by Prof. Seebeck in 1822. Some ten years afterwards, Nobili constructed the well-known thermo-electric pile. Associating this instrument with a galvanometer, Melloni at once turned Seebeck's discovery into a thermoscope of surpassing delicacy. The fruit of one man's work thus soon became the seed of new and more vigorous investigation. And so prolific was this seed in Melloni's hands, that the blackened face of a thermo-pile is at present considered the indispensable pre-requisite in every exploration in "the domain of radiant heat." For six years Melloni pushed on with his researches; determining the amount of heat transmitted through innumerable solids and liquids—their relative *diathermancy*, as he expressed it—and using these determinations to investigate the quality of heat emitted from various sources. But the discovery with which his name will always be associated is that each material possesses a selective absorption, a veritable heat-tint, to which he gave the name of *thermochrosis*; thus confirming and explaining a similar fact previously noticed by De La Roche. Hence it was that Melloni called the volume "La Thermochrose," in which he grouped together the investigations that he had published, in the "Annales de Chimie," and the *Comptes Rendus*, between the years 1833 and 1839. The appearance of these researches was characterised by M. Biot as "un nouveau champ de découvertes, que M. Melloni a exploité avec un sagacité une addresse et une patience inimaginables;" the subsequent verdict of physicists has not lessened this high opinion.

The interest awakened by Melloni's inquiries was no doubt the main cause of the rapid additions to our knowledge of the phenomena of radiation and absorption, that followed. Among others, Forbes, Dulong and Petit, De la Provostaye and Desains, Knoblauch, Jamin, Masson and Courtépée, Müller and Balfour Stewart, signalised themselves by the value of their investigations in this department of natural knowledge. But the whole of these inquiries were directed to the behaviour of solids or liquids, or the analysis of radiation itself. The influence of gases and vapours on radiant heat was not entertained. Melloni, indeed, thought such attenuated bodies could not come within the reach of experiment; for he had ascertained that a column of air some 20 ft. long exerted practically no absorption on the radiation from his source. Pouillet and Forbes, however, showed that the heat of the solar rays are largely absorbed by our atmosphere; and Franz believed (though erroneously) that he discovered a considerable absorption of heat by the air contained in a tube only 3 ft. long.

Briefly speaking, this was the state of our knowledge in this branch of Physics when Dr. Tyndall approached the subject in 1859. After having wrought for twelve years, Prof. Tyndall has now gathered into the volume before us the important results his unremitting labour has won. A summary of these results must be left to another article.

W. F. BARRETT

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

On the supposed new Marine Animal from Barraud's Inlet

As some interest seems to be excited as to the nature of the animal that forms the long calcareous axis that has been received from Barraud's Inlet, I forward you a copy of a short notice I read on the subject before the California Academy of Sciences, July 17, 1871. I also enclose a piece of the stem with some of the soft parts still adhering to it, as it is possible its examination by competent observers will determine if I correctly referred it to the sponges.

"An examination of the specimens received from Barraud's Inlet enables me to refer them to the Protozoa class, Spongidæ or sponges. Although apparently nothing but the calcareous stem has reached us, yet on some specimens I found one end of the stem covered with a horny substance, which, when moistened and examined under the microscope, presents the character of a true sponge, being formed of a tough sarcode arranged in the form of irregularly reticulated tubes, the sides of which are studded with minute pores. The arrangement of the sarcode round the axis is not circular, but has somewhat the appearance of a Maltese cross. The central axis is formed by calcified layers of a tough chitinous substance. In the specimens we have received the greatest thickness is about $\frac{3}{4}$ of an inch, but the longitudinal fissures found in many of the stems would indicate that they had shrunk. They contain about 80 per cent. of carbonate of lime. At each end the stem is tapered off. The top terminates in a fine hair-like prolongation of uncalcified chitinous substance. The lower part of the stem, which in our specimens is the only part covered with sarcode,

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also tapers down to about the thickness of a straw, and here there is no calcified axis. A thin section of the stem in its thickest part showed that it had been formed in concentric layers which were perfectly circular and presented nothing corresponding to the stellate arrangement of the sarcode. These rings undoubtedly represent different phases in the life of the animal. I have counted as many as thirteen in one section, and should they indicate animal deposits, this would give us thirteen years as the time required for their formation, a period not too long when we consider the length (upwards of seven feet) which some of these stems have attained. Whether this specimen is new I am not prepared to state, and shall not therefore name it, although I believe it has not been before observed. Its generic relations will, I think, be with Hyalonema and Euplectella, both sponges of the Pacific." JAMES BLAKE

San Francisco, Oct. 27

Misleading Cyclopædias

CAN any of your readers inform me if there is such a thing as a good and honestly constructed cyclopædia—one that does not send you hunting for information from one volume to another, and refer you backwards and forwards to articles that do not exist?

I have been repeatedly annoyed by this kind of will-o'-the-wisp, but have to-day met with such an outrageous example of it, that, although it involves some trouble, I feel it to be a duty to make a public exposure of it in your columns.

Requiring some facts on unusual atmospheric refraction, I turned to "Refraction" in the "English Encyclopædia." This article referred me to "Mirage, Fata Morgana," &c., for information on this branch of the subject. Turning to "Mirage," I found not a word, but another reference to "Reflection and Refraction, Atmospheric, Extraordinary." Next I tried "Fata Morgana," again the same reference. Coming back to letter R, I found the article "Reflection and Refraction," but was here referred to "Light, Optics, Refraction, Refrangibility;" then to letter A, "Atmosphere, Atmospheric"—nothing on the subject. Letter E, "Extraordinary Refraction"—nothing but a reference back again to "Mirage!" "Light, Optics, and Refrangibility" contain nothing on the subject.

I was thus sent on a search through five volumes of the work, and made to hunt out nine distinct headings for what does not exist; and what makes the matter worse is, that the writer of the article "Refraction," at the end of the work, must have *known* that it did not exist when he referred back to "Mirage, Fata Morgana," &c., which words have not a word of information appended to them.

An alphabetical cyclopædia is so much the most convenient for reference, and might be such an invaluable addition to a library, that it is the more to be regretted that it should be brought into disrepute by the absence of all efficient editorial supervision.

A. R. WALLACE

Rainbows on Blue Sky

IN NATURE for Nov. 21 a correspondent asks for examples of bows seen on a cloudless background.

I have seen this phenomenon twice at least. In one instance I remember that the extremities of the bow were seen against cloud, while the central portion bridged a space of clear blue sky.

A more perfect example occurred on the 19th of February in the present year. The following is a *verbatim* extract from my notes of that day:—

"Peculiar rainbow at 11.50 A.M.; perfect (except quite near the extremities), fairly bright, but projected throughout its entire length against clear blue sky. No rain was falling at the time, nor was there any appearance of falling rain on the sky, but the character of the clouds and of the weather was consistent with the supposition of slight and partial showers."

The phenomenon, although rare, does not seem to call for any special explanation. In showery weather, especially with a low barometer, one may sometimes see rain falling from a mere shred of cloud, the sky round about being clear. In such a case it is evident that there may be places whence an observer would see a rainbow against blue sky. Even should there be no visible cloud from which the rain seems likely to have fallen, the same explanation will still serve, for the cloud may be too attenuated to be visible, or may indeed be actually exhausted, the rainbow being formed on its last drops.

It scarcely needs to be pointed out, that when a rainbow is seen, as it usually is, against a cloud, the presence of the cloud is accidental rather than essential, the bow being formed not on the cloud, but on the drops of falling rain, and those being generally much nearer to the observer than the cloud.

Clifton, Nov. 25 GEORGE F. BURDER

The Greenwich Date

I AM anxious to obtain the solution of a question which has for some time perplexed me, and which is rendered more pressing than formerly, now that telegraphic communication is established between England and Australia.

It appears that a telegram sent on October 21, 3h. 5m. mean astronomical time at Adelaide, was received on October 21, 21h. 40m. mean astronomical time at Greenwich. Now, to obtain the Greenwich date of its despatch, we apply the longitude in time, adding when the place is west of Greenwich, and subtracting when it is east. Adelaide is 9h. 35m. east of Greenwich, the date sought is October 20, 18h. 10m. But suppose a place 9h. 35m. west of Greenwich, then the date sought comes out October 21, 13h. 10m., that is to say, the result of the operations gives a difference in the day of the month at places where, in fact, the day of the month must actually be the same. The query then is—in what part of the globe, and in what meridian, does October 20 end, and October 21 begin?

Fleetwood Vicarage JAMES PEARSON

Ocean Meteorological Observations

I PRESUME that anyone looking at the chart on page 43 of this week's NATURE, or reflecting on the circumstances under which barometric observations at sea are ordinarily taken, will agree with me that it would be wiser to give only two places of decimals, and not indicate a degree of refinement which the observations do not warrant. This point being granted (and even if it is not I shall maintain the same line of argument), I submit that the writer of the article is in error in saying on page 44: "Range corrections for pressure and temperature over the region under discussion are not yet accurately enough known to justify the committee in 'correcting' the results on the large chart by hypothetical corrections."

The daily range of the barometer in the very square under notice was investigated under Admiral Fitzroy's direction, and the results were published so long ago as 1861, as the seventh number of Meteorological Papers, under the title of "Intertropical diurnal range tables of the barometer."

It is very strange if this publication is unknown both to the author of the work reviewed and to the reviewer, and yet it is so cognate to the subject in hand that there would surely have been some reference to it, had they been aware of what had already been done. G. J. SYMONS

Nov. 25

Earthquake

AN earthquake was felt at the Cavendish Bridge Brewery, near Derby, on November 13th, at 4h. 10m. P.M.

Mr. G. T. Eaton, who was in his greenhouse, says "the glass was very much shaken." Mrs. Sandford was considerably shaken by a vibratory motion of her chair. Mrs. Eaton's children, who were upstairs, were alarmed. The windows rattled, and the glasses danced on the tables. The sky was dark and threatening, with a slight fall of sleet and snow.

I have delayed sending a report until further evidence could be obtained. It is now certain that the shock extended through Shardlow; and the earthquake was also felt in the neighbourhood at Aston, Castle Donington, and more particularly at Chellaston.

E. J. LOWE

Highfield House, Nottingham, Nov. 24

The Birth of Chemistry

MR. RODWELL writes:—"'The Greek name for tin, 'kassiteros' (*κασσιτέρος*), was perhaps derived from the Insulæ Cassiterides or Scilly Islands;" but he does not state how these islands came by such a high-sounding name.

I have heard that the root word is Sanscrit, and was known in India before the Phœnicians discovered Britain. A. H.

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